

**I claim:**

1. A method for generating a parity grid matrix from an indexed representation of  
5 an image, said method including the steps of:  
calculating a parity value for each of specified rows and columns of said indexed  
representation;  
determining a parity restoration value for each of said specified rows and columns  
that exhibit a non-zero parity value; and  
10 adding said parity restoration values to one or more selected elements of said  
specified rows and columns that exhibit a non-zero parity value.
2. A method according to claim 1, wherein said indexed image comprises a data  
matrix.  
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3. A method according to claim 1, wherein said specified rows and columns  
comprise alternate rows and columns of said indexed image.
4. A method according to claim 1, wherein said specified rows and columns  
20 comprise every third row and every third column of said indexed image.
5. A method according to claim 1, wherein said step of calculating a parity value for  
one of said specified rows or columns includes the sub-steps of:  
calculating the sum of the elements contained in said selected row or column;  
25 and  
calculating the modulus of said sum and a selected integer value of parity level.
6. A method according to claim 1, wherein said selected elements are selected by an  
edge detection process.  
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7. A method according to claim 6, wherein said edge detection process identifies  
regions of greatest variation in said image, said variation selected from the group  
consisting of:

intensity variation;  
hue variation; and  
saturation variation.

- 5 8. A method for detecting alterations to an image, said method including the steps  
of:  
calculating a parity value for each of specified rows and columns of a parity grid  
encoded representation of said image; and  
determining each non-zero occurrence of said parity values, each said non-zero  
10 occurrence being indicative of a row or column containing one or more altered elements.
9. A method according to claim 8, wherein the intersection of a row of non-zero  
parity value and a column of non-zero parity value is indicative of the location of an  
alteration to said image.
- 15 10. A method for embedding information in an image, said method including the  
steps of:  
generating a parity grid matrix from an indexed representation of said image;  
selecting elements of said parity grid matrix for alteration; and  
20 altering said selected elements according to a representation of said information.
11. A method according to claim 10, wherein said selected elements are selected by  
an edge detection process.
- 25 12. A method according to claim 11, wherein said edge detection process identifies  
regions of greatest variation in said image, said variation selected from the group  
consisting of:  
intensity variation;  
hue variation; and  
30 saturation variation.
13. A method for retrieving information embedded in an image, said method  
including the steps of:

calculating a parity value for each of specified rows and columns of a parity grid encoded representation of said image; and

combining each non-zero value of said parity values to reconstruct said embedded information, said information being embedded in said image by alteration of said parity grid encoded representation of said image.

14. A method according to claim 13, wherein said step of calculating a parity value for one of said specified rows or columns includes the sub-steps of:

calculating the sum of the elements contained in said selected row or column;

10 and

calculating the modulus of said sum and a selected integer value of parity level.

15. An apparatus for generating a parity grid matrix from an indexed representation of an image including:

15 means for calculating a parity value for each of specified rows and columns of said indexed representation;

means for determining a parity restoration value for each of said specified rows and columns that exhibit a non-zero parity value; and

20 means for adding said parity restoration values to one or more selected elements of said specified rows and columns that exhibit a non-zero parity value.

16. An apparatus according to claim 15, wherein said indexed image comprises a data matrix.

25 17. An apparatus according to claim 15, wherein said specified rows and columns comprise alternate rows and columns of said indexed image.

18. An apparatus according to claim 15, wherein said specified rows and columns comprise every third row and every third column of said indexed image.

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19. An apparatus according to claim 15, wherein said means for calculating a parity value for one of said specified rows or columns includes:

means for calculating the sum of the elements contained in said selected row or

column; and

means for calculating the modulus of said sum and a selected integer value of parity level.

5 20. An apparatus according to claim 15, further including edge detection means for selecting said selected elements.

21. An apparatus according to claim 20, wherein said edge detection means is adapted to identify regions of greatest variation in said image, said variation selected from  
10 the group consisting of:

intensity variation;  
hue variation; and  
saturation variation.

15 22. An apparatus for detecting alterations to an image including:  
means for calculating a parity value for each of specified rows and columns of a parity grid encoded representation of said image; and  
means for determining each non-zero occurrence of said parity values, each said non-zero occurrence being indicative of a row or column containing one or more altered  
20 elements.

23. An apparatus according to claim 22, wherein the intersection of a row of non-zero parity value and a column of non-zero parity value is indicative of the location of an alteration to said image.

25 24. An apparatus for embedding information in an image including:  
means for generating a parity grid matrix from an indexed representation of said image;  
means for selecting elements of said parity grid matrix for alteration; and  
30 means for altering said selected elements according to a representation of said information.

25. An apparatus according to claim 24, wherein said means for selecting said

selected elements comprises edge detection means.

26. An apparatus according to claim 25, wherein said edge detection means identifies regions of greatest variation in said image, said variation selected from the group

5 consisting of:

intensity variation;

hue variation; and

saturation variation.

10 27. An apparatus for retrieving information embedded in an image including:

means for calculating a parity value for each of specified rows and columns of a parity grid encoded representation of said image; and

means for combining each non-zero value of said parity values to reconstruct said embedded information, said information being embedded in said image by alteration  
15 of said parity grid encoded representation of said image.

28. An apparatus according to claim 27, wherein said means for calculating a parity value for one of said specified rows or columns includes:

means for calculating the sum of the elements contained in said selected row or  
20 column; and

means for calculating the modulus of said sum and a selected integer value of parity level.

29. A computer program product having a computer readable medium having a  
25 computer program recorded therein for generating a parity grid matrix from an indexed representation of an image, said computer program product including:

computer program code means for calculating a parity value for each of specified rows and columns of said indexed representation;

computer program code means for determining a parity restoration value for each  
30 of said specified rows and columns that exhibit a non-zero parity value; and

computer program code means for adding said parity restoration values to one or more selected elements of said specified rows and columns that exhibit a non-zero parity value.

30. A computer program product according to claim 29, wherein said indexed image comprises a data matrix.

5 31. A computer program product according to claim 29, wherein said specified rows and columns comprise alternate rows and columns of said indexed image.

32. A computer program product according to claim 29, wherein said specified rows and columns comprise every third row and every third column of said indexed image.

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33. A computer program product according to claim 29, wherein said computer program code means for calculating a parity value for one of said specified rows or columns includes:

computer program code means for calculating the sum of the elements contained  
15 in said selected row or column; and

computer program code means for calculating the modulus of said sum and a selected integer value of parity level.

34. A computer program product according to claim 29, further including computer  
20 program code means for edge detection to select said selected elements.

35. A computer program product according to claim 34, wherein said computer program code means for edge detection is adapted to identify regions of greatest variation in said image, said variation selected from the group consisting of:

25 intensity variation;  
hue variation; and  
saturation variation.

36. A computer program product product having a computer readable medium  
30 having a computer program recorded therein for detecting alterations to an image, said computer program product including:

computer program code means for calculating a parity value for each of specified rows and columns of a parity grid encoded representation of said image; and

computer program code means for determining each non-zero occurrence of said parity values, each said non-zero occurrence being indicative of a row or column containing one or more altered elements.

5 37. A computer program product according to claim 36, wherein the intersection of a row of non-zero parity value and a column of non-zero parity value is indicative of the location of an alteration to said image.

38. A computer program product product having a computer readable medium  
10 having a computer program recorded therein for embedding information in an image, said computer program product including:

computer program code means for generating a parity grid matrix from an indexed representation of said image;

15 computer program code means for selecting elements of said parity grid matrix for alteration; and

computer program code means for altering said selected elements according to a representation of said information.

39. A computer program product according to claim 38, wherein said computer  
20 program code means for selecting said selected elements comprises computer program code means for edge detection.

40. A computer program product according to claim 39, wherein said computer  
25 program code means for edge detection identifies regions of greatest variation in said image, said variation selected from the group consisting of:

intensity variation;

hue variation; and

saturation variation.

30 41. A computer program product product having a computer readable medium having a computer program recorded therein for retrieving information embedded in an image, said computer program product including:

computer program code means for calculating a parity value for each of specified

rows and columns of a parity grid encoded representation of said image; and

computer program code means for combining each non-zero value of said parity values to reconstruct said embedded information, said information being embedded in said image by alteration of said parity grid encoded representation of said image.

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42. A computer program product according to claim 41, wherein said computer program code means for calculating a parity value for one of said specified rows or columns includes:

10 computer program code means for calculating the sum of the elements contained in said selected row or column; and

computer program code means for calculating the modulus of said sum and a selected integer value of parity level.

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